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The Geology of the Lake District and the Scenery as Influenced by Geological Structure. By J. E. MARR. Cambridge: Cambridge University Press, 1916. Pp. 220, figs. 51, map in pocket.

The English Lake District is well adapted to call forth the interest of the geological student by reason of the variety of its geological structure and the significance of its physical features. As an increasing number of those interested in geology visit it each year, and the need of a special treatise upon its geologic features has come to be felt, the author has prepared a condensed account of the geology of this picturesque area.

The Lake District proper is composed of Lower Paleozoic strata, but its borders are formed of a roughly annular girdle of newer strata, partly of Carboniferous age, but partly belonging to the Permian and Triassic. The Lower Paleozoic rocks were profoundly affected by the great Caledonian orogenic disturbance at the close of the Silurian. Great over-thrusts of the Scottish Highland type appear to have developed here also, though the author considers "lag fault" as an alternative hypothesis in the explanation of the observed phenomena.

The last third of the book describes and discusses the critical features of the Pleistocene ice sheet, which, by its erosive and depositional work, has contributed so much to the beauty and interest of this celebrated region.

R. T. C.

Origin of the Iron Ores at Kiruna. By REGINALD A. DALY. Veten-skapliga och praktiska Undersökningar. Lappland. Anordnade af Loussavaara—Kürunavaara Aktiebolag. Geology No. 5. Stockholm, 1915. Pp. 1-30, figs. 4.

Professor Daly, thoroughly familiar with the writings of Geijer, Stutzer, and others, has made a short field study of the Kiruna district, particularly of the nature and origin of the numerous small inclusions of iron ore scattered through the quartz porphyry which forms the hanging wall of the ore bodies. These are commonly held to be xenolithic inclusions derived from an older invisible ore body, but the writer concludes, as a result of his field study, that the ore inclusions represent so many frozen-in units of differentiation modified in part by later resorption. The ore bodies are believed to have formed by the gravitational assemblage of similar units at the base of the quartz porphyry. Geijer has emphasized the view that both the iron ores and quartz porphyry are of extrusive origin. Professor Daly, following Stutzer,

holds that the quartz porphyry and the underlying syenite are essentially contemporaneous parts of a composite laccolith. It is suggested that the heated condition of the syenite at the time of the quartz-porphyry intrusion favored notable differentiation by prolonging the magmatic life of the later intrusive.

The origin of the ore inclusions in the porphyry is the crucial point in any hypothesis of the origin of the Kiruna ores. Professor Daly's view is a satisfactory interpretation of the field relations; likewise it accords best with recent opinion concerning differentiation processes.

H. R. B.

Journal of the Washington Academy of Sciences, V, 1915, 687 pages.

Articles of geologic interest in recent numbers of the *Journal* are: "The Paleozoic Section of the Ray Quadrangle, Ariz.," by F. L. Ransome; "Factors in the Movement of the Strand Line," by Joseph Barrell; "The Calculation of the Calcium Orthosilicate in the Norm of Igneous Rocks," by H. S. Washington; and "The Solubility of Calcite in Water in Contact with the Atmosphere, and Its Variation with Temperature," by R. C. Wells. Chase Palmer contributes an article on "Bornite as Silver Precipitant."

H. R. B.

Mineral Land Classification in Part of Northwestern Wisconsin.

By W. O. HOTCHKISS, assisted by E. F. BEAN and O. W. WHEELWRIGHT. Wisconsin Geol. and Nat. Hist. Survey, Bull. No. 44, 1915. Pp. 376, pls. 8, figs. 39, maps 90.

This volume constitutes the report on the land classification of 87 townships in northern Wisconsin. The work was done during the field seasons of 1913 and 1914. The object of the survey was "to discover the evidence that exists as to the presence or absence of iron-bearing rocks, and as to the geologic structure of the region." The difficulties encountered either by the geologist who attempts to unravel the pre-Cambrian geology of this heavily drift-covered area, or by those who seek to locate iron ores here may be appreciated from the fact that in this area of over 2,000,000 acres the total exposed area of rocks of all kinds does not exceed 300 acres. Naturally, the report is based largely on the comprehensive series of magnetic observations.

Part I includes chapters treating of the methods of field work, general geology of the area covered, magnetic observations, land classi-